INTELLIGENCE AND CHILDBEARING*

By D. BAIRD, M.D., F.R.C.O.G.
Regius Professor of Obstetrics and Gynæcology in the University of Aberdeen

and Eileen M. SCOTT, M.A.
Psychologist on the staff of the Social Medicine Research Unit of the Medical Research Council, seconded to work in Aberdeen

INTRODUCTION

By Professor D. Baird

I HAVE shown in previous publications that reproduction is more efficient in private than in hospital patients in the sense that in the latter the stillbirth rate is twice and the neonatal mortality three times that in the former. Private patients correspond roughly to the Registrar General's Social Classes I and II and the hospital patients to the Registrar General's Social Classes III, IV and V.

It is widely held that improvements in living conditions and diet have contributed greatly to the striking fall in both the stillbirth and the infant mortality in recent years. While this is no doubt so, the fact remains that there has been little or no narrowing of the gap between the rates in the various social classes. Why should this be so ? Is it because the resources of the educational and social services have not been directed to the points where they are most needed or are those in the lower economic groups too unintelligent to make use of the services provided? For the past two years my colleague, Miss Scott, has been studying the influence of intelligence and social class on maternal efficiency in Aberdeen and her work forms the basis of this paper.

One might expect that an efficient mother would be healthy, have planned to have the baby, would be well informed about the facts of pregnancy and labour, would have consulted a doctor early in the pregnancy, would eat a good diet, and would have good ideas about the care and feeding of young babies.

Miss Scott will give you the results of her study of the influence of intelligence on these various aspects of, what we have termed, maternal efficiency, after which I will discuss the relationship between intelligence, physical health and efficient childbearing.

CERTAIN ASPECTS OF MATERNAL BEHAVIOUR DURING PREGNANCY

By Eileen M. Scott

During the last three years in Aberdeen (1950-52), a comprehensive study has been carried out on some of the many constitutional and environmental factors which play a part in childbearing. (Baird and Illsley, 1953.) The survey has covered certain aspects of medical, dietary, social and psychological fields of study. Much of the data collected within each field has not yet been analysed, so that any report at present must be restricted in scope. The present paper describes some of the methods used in the psychological study and some of the results obtained.

The Sample

The study was concerned with women having their first babies, because they represent approximately 40 per cent of all births in Great Britain, and because medical complications are frequent in this group. It was decided to exclude unmarried mothers, women not normally resident in the city of Aberdeen, and women coming into hospital as emergency cases—that is, those who had not booked for hospital confinement. They were omitted mainly because of the difficulty of obtaining comparable information from such groups. The remainder of women having first babies in Aberdeen is about 1,000 per year, of which about 850, or some 85 per cent, book for confinement in the

* Papers read at a Members' Meeting of the *Eugenics Society* on May 27th, 1953.

maternity hospital. This population of married women, resident in Aberdeen, booked for hospital confinement, and having their first babies was selected for study. They are called, for brevity, booked, married, city, primigravidæ, or B.M.C.P. Some 10 per cent of women annually book for nursing home confinement, and some 5 per cent have their babies at home, which accounts for the remaining 15 per cent who were not included in the population at risk.

As it was not practicable to carry out a detailed study on some 850 women annually, a method of sampling this population had to be decided. From the psychologist's point of view, there are many advantages in studying a group of volunteer patients; they are, for example, likely to be more co-operative and eager to talk about themselves. The fact that they are volunteers, however, means that the factor of selection makes general conclusions less valid. (Rosen, 1951.) It was therefore decided to take every sixth booking—virtually a random sample of one-in-six.

The women were grouped into classes according to the husband's occupation on the basis of the Registrar General's Classification of Occupations (1950). We shall refer to these as " Social Classes I to V." The social investigation was concerned with the differences between social classes, and a straight one-in-six sampling procedure did not allow for sufficiently large numbers to draw reliable conclusions from each class. A greater proportion, therefore, was taken in Social Classes I, II, IV and V to obtain the larger numbers required by the social study in these groups. The psychological investigation includes these extra cases, except in Social Class IV, where only half the additional sample was seen, because of limited time.

Table 1 shows the numbers and percentages in each class for the sample and the corresponding numbers and percentages in each class for all booked married city primigravidæ.

There are larger percentages in Classes I, II and V and smaller in III than in the corresponding hospital population. Social Class IV is also smaller due to reasons explained above. The nature of the sample thus implies that it is necessary to consider any analysis by individual social classes before extending conclusions to all hospital primigravidæ. The distribution of age in the sample is virtually the same as in the hospital population.

Table 1

PERCENTAGE DISTRIBUTION OF THE SAMPLE BY SOCIAL CLASS OF HUSBAND

REGISTRAR GENERAL'S SOCIAL CLASS	TOTAL NUMBER B.M.C.P. 1950-52 (2556 CASES)	PERCENTAGE B.M.C.P.	TOTAL NUMBER SAMPLE 1950-52 (401 CASES)	PERCENTAGE SAMPLE
I	81	3·2	16	4·0
II	163	6·4	31	7·7
III	1613	63·0	196	48·9
IV	360	14·1	48	12·0
V	339	13·3	110	27·4
ALL CLASSES	2556	100·0	401	100·0

The Method

The methods used were largely determined by the wider study rather than by the particular aspects covered in the present paper. (Stewart and Scott, 1953). Both interview and test techniques were used.

As a result of a pilot study of thirty cases, it was found that, of the various methods tried, two sessions of about an hour each gave the best results. In this way it was possible to obtain the maximum information compatible with a low default rate. The interviews took place during the sixth month of pregnancy, since by this time most women had stopped outside work, and could fit in an extra visit to the clinic without difficulty. Further, this timing ensured that few cases were lost through premature delivery. Those who booked at the clinic for the first time after the sixth month were not available for the psychological study, as the dietary study took place in the seventh month, and the social study in the eighth month. This strictly limited any extension of the psychological study beyond the sixth month.

The patients were given an appointment by the receptionist at the time of a routine visit to the antenatal clinic. They were told that the purpose of the special appointment was to give them an opportunity of discussing matters relating to their first pregnancies. They were not told that they were going to see a psychologist, since it was felt that this might cause unnecessary anxiety. Even so, it was anticipated that many would fail to keep the appointment. In fact, only seven patients or 1·7 per cent of the 408 who were given an appointment, failed to turn up for a first interview. Co-operation in the second visit also was on the whole surprisingly good. Eighteen patients, however, out of the 401 who attended the first interview, failed to return for a second session. In view of this, therefore, information has not been uniformly obtained for all 401 patients.

The Interview

The first session opened with an explanation of why the patient had been asked to come along. It was made clear that this was a special survey on women having their first babies, and that we would be grateful for any information which the patient could give us regarding her health, reactions to pregnancy and so on. At the same time we would be glad to answer any questions she would like to ask about pregnancy, labour, hospital or any other related matter.

The patient was then asked to give a few personal details about health, education, employment and family history. This usually had the desired effect of putting patients at their ease. They were then asked if they would co-operate further in the research project by doing two tests (Raven's Progressive Matrices 1938 and four sub-tests of the Wechsler-Bellevue verbal battery). Progressive Matrices results only are considered in this paper. (Raven, 1938.) The twenty minute version of this test was used because of time limitations. Two patients refused to do the tests. Three others were not asked to complete the Matrices test—two because they had previous experience of administering and scoring the test, and one because she had already expressed strong prejudices against all psychological testing. In this latter case it was felt that more useful information could be obtained in the interview if the tests were not mentioned.

At the end of this first session, the patients were invited to return for another visit and a suitable appointment was then made. They were asked to make a note of any matters relating to their pregnancy or confinement on which they would like information, with a view to discussion during the second session.

In addition to any such points raised by the patients themselves in the second hour, other topics were introduced into the conversation by the psychologist. These topics had been selected to ascertain each patient's knowledge of childbirth, hospital, care of children, and her views on the size and spacing of her family. Other matters relating to financial, domestic and marital aspects were also discussed, but consideration of these does not come within the scope of this paper.

There are several different sets of norms available for " timed " Progressive Matrices test grades, with only small differences between them. They are mainly from Service sources. Royal Naval norms have been used in the following tables; they differ from A.T.S. norms by only one point.

Table 2

PERCENTAGE DISTRIBUTION OF THE SAMPLE BY PROGRESSIVE MATRICES (1938) GRADES

MATRICES GRADE	SCORE (R.N. NORMS)	PERCENTAGE CASES (RAVEN)	PERCENTAGE CASES SAMPLE	PERCENTAGE CASES ESTIMATED ON B.M.C.P. POPULATION 1950–52
A	45-60	10	13·4	13·1
B	38-44	20	25·3	26·3
C	27-37	40	36·3	37·4
D	18-26	20	20·7	19·2
E	0-17	10	4·3	4·0
ALL GRADES		100	100·0	100·0

The second table shows the percentage distribution of the sample by Progressive Matrices, grade A being highest and E lowest

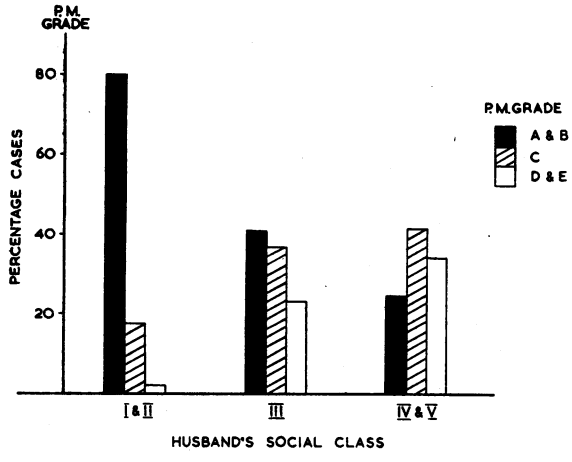
scores. Grades A and B have a greater percentage and grade E less in the sample than the norms. This can also be observed when the percentages are corrected for social class composition to apply to the B.M.C.P. population. It might be that the smaller percentage in the E grade is due to the exclusion of unmarried mothers, late booking cases and home confinements. Other investigations, however (Vernon, 1949), have shown similarly skewed distributions.

It will be remembered that we are dealing with a sample stratified by husband's social class. Considerable evidence exists in the hospital population for 1950 of a highly significant relationship between the social classes of husband and wife. Thus we may possibly assume that the term " husband's social class " conveys something of the " married couple's social class."

Similarly a positive correlation has been shown by Willoughby between intelligence test scores (both verbal and non-verbal) of husbands and wives (Willoughby, 1927; Richardson, 1939), so we might perhaps assume from wife's Progressive Matrices score, something of the intelligence level of the couple. The first figure shows the relationship between the husband's social class and the wife's Progressive Matrices grade for the sample.

Figure I

PROGRESSIVE MATRICES (1938) GRADE AND HUSBAND'S SOCIAL CLASS
396 BOOKED MARRIED CITY PRIMIGRAVIDAE – ABERDEEN 1950–52



It can be seen that the percentage of A and B grades, i.e. the higher intelligence grades, decreases steadily from 80 per cent as we go from Social Classes I and II to 24 per cent in Social Classes IV and V. Conversely the percentage of D and E grades increases from 2 per cent in Social Classes I and II to 34 per cent in Classes IV and V. In view of this relationship between Matrices score and social class it is possible that social class may enter into any observed association between Matrices and behaviour.

Social class is also strongly associated with age at first pregnancy, Classes I and II tending to have first pregnancies at an older age (66 per cent are over 25 years of age in the sample) than Classes IV and V (38 per cent are over 25 years of age in the sample). Each grading of behaviour has been considered by age, where this was practicable, as it was felt that older women might well behave differently from younger, so that a similar qualification obtains here, i.e. where there is an association between age and behaviour, it may well be accounted for by the greater incidence of younger women in Social Classes IV and V, and older women in Classes I and II. There is, however, practically no correlation (—·0004 on sample) between age at first pregnancy and Progressive Matrices score, so that we may safely neglect the influence of the relationship between Age and Matrices for the age range within this sample.

The Results

A probability of 1 in 100 or less that any relationship would occur by chance alone, I shall refer to as " highly significant." A probability of 5 in 100 or less, but greater than 1 in 100 I shall refer to as " significant " throughout. I shall not show the actual numbers, but illustrate by means of diagrams based on percentages. The numbers are given in an appendix at the end of the paper.

This paper is concerned solely with the relationship between Progressive Matrices test scores and four different aspects of patients' behaviour before and during first pregnancy; these are as follows:

1. Use of birth control.

2. Use of sources of information about pregnancy and labour.
3. Quality of diet during pregnancy.
4. Intention to breast-feed.

For each aspect of behaviour, information given by the patients forms the basis for gradings.

1. Use of Birth Control

Patients were asked during interview whether they had ever used any method of birth control, whether they were still using contraceptive methods at the time of conception, and what their plans were for future use of birth control.

It is recognised that this is rather a difficult subject to discuss. There may be considerable risk of influencing the patients' responses by leading questions, and care had to be taken to avoid this. The subject was introduced by asking patients how many children they wanted to have, how long they would like between first and second children and how they proposed to accomplish this. It was then easier to ask if they had " taken any precautions before," whether they were " still continuing at time of conception " and what plans they had made for after their first pregnancy.

A further difficulty lies in analysing the use of different methods of birth control. Numbers do not allow us to consider each method separately, so some form of grouping had to be chosen. If we group methods of birth control according to whether husband or wife is mainly responsible we find insufficient cases in the " wife's " group for statistical treatment. We have grouped together all appliance methods, that is, mechanical and chemical methods whether used by wife or by husband, and all non-appliance methods, that is, *coitus interruptus* and safe period, and thus we obtain adequate numbers in each group. As use of birth control methods is to be analysed by wife's intelligence test score and husband's social class, it may be argued that better results might be obtained by a " responsibility " grouping —thus relating husband's social class to methods where husband is responsible, and wife's intelligence to methods where wife is responsible. It will be remembered, however, that we can understand something of the couple's social class and intelligence level from our available measures of husband's social class and wife's intelligence level. The results seem to justify this grouping by appliance and non-appliance methods.

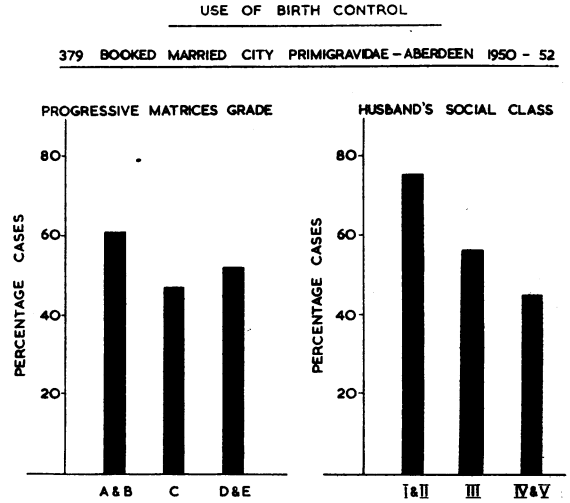
Use of birth control is distinguished from effective use in the following results :

(a) *Use of birth control before first pregnancy.*

This information was obtained from 384 patients, (383 who attended the second session and one who attended the first only. As five patients were not tested the tables are based on 379 cases). Of these couples 204 had used some form of contraception before first pregnancy—132 used non-appliance (twelve safe period) and 72 appliance methods (three diaphragm). Ten couples had used two or more methods combined, and nine couples had used different methods at different times. These nineteen couples are classed in the appliance group if mechanical or chemical methods were ever used, and as non-appliance if only non-appliance methods were used.

There is a highly significant association between husband's social class and the use of birth control. As can be seen from Figure II, 75 per cent of couples in Social Classes I and II, 56 per cent in Social Class III and 45 per cent in Social Classes IV and

Figure II



V said they used some type of birth control. This relationship holds for Matrices grades A and B and for C. D and E cannot be tested because of small numbers.

Wife's intelligence test grade is associated, but not significantly, with the use of birth control of all types. Birth control, however, is more extensively used in the higher intelligence test grades. This trend holds for all social classes, and within each class, but never approaches significance.

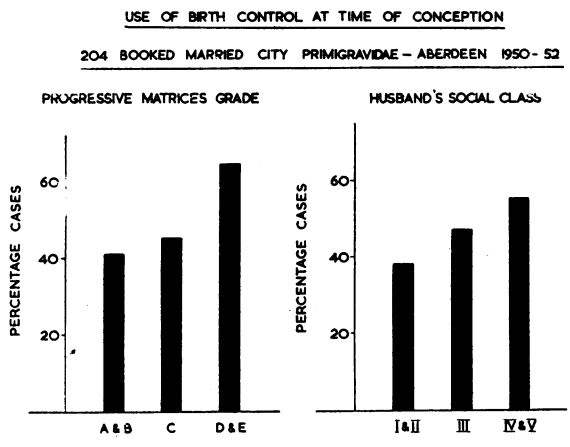
Intelligence test grade is not significantly related to whether appliance or non-appliance methods of birth control are used, which appears also to be a social class phenomenon. There are highly significant differences between the social classes in methods used. Of those using birth control, non-appliance methods were used in 50 per cent of cases in Social Classes I and II, 58 per cent in Social Class III, and 84 per cent in Social Classes IV and V. These results parallel Lewis-Faning's report (1949) although direct comparison is not feasible owing to differences in the samples. It appears that " tested " intelligence in this sample may be a contributory factor in the use of birth control, but plays no part in determining the methods to be used.

Older women use birth control more extensively irrespective of intelligence test score, which may be an effect of the higher proportion of older women in Social Classes I and II. We cannot test this because of small numbers. The association between test score and the use of birth control is more marked in the younger age group under twenty-five years of age. There are no significant differences between the over and under twenty-five age group for different methods of birth control, although older women show a greater tendency to use appliance methods.

(b) *Continuing use of birth control at time of conception.**

It is not, of course, suggested that mere use of birth control indicates planning for first pregnancy. The failure of contraception in the group who used birth control, however, will give some indication of unplanned first pregnancies. (Figure III.)

Figure III



The proportion of those couples still using birth control methods at the time of conception increases significantly with a fall in the wife's intelligence test grade. We find the same relationship within each social class. There are no significant differences in this " failure rate " between social classes. Thus " successful " use of all methods of birth control by the couple is related to the higher intelligence grade of the wife. This supplements Lewis-Faning's suggestion (1949) that " education " is related to skill with which contraceptive measures are applied by the couple.

Younger women are concerned in a higher proportion of " failures " than older women. It is possible that this is due to a lower fertility rate in the older group (Monahan, 1950), perhaps supplemented by the greater care taken by couples in this group as will be noted in other aspects of behaviour. In the younger women " failures " occur more frequently in the lower intelligence grades, while among older women the differences between test scores for " failures " is negligible for all methods, together or separately.

* In the figures quoted for failure rate by method used, the ten couples using a combination of appliance and non-appliance methods are omitted. The nine couples who used different methods at different times are classed according to the last method used before conception.

If we consider the " failure rate " by method of birth control used in the younger age group we find for couples using non-appliance methods that the " failure rate " increases from 60 per cent in the A and B grades, 72 per cent in the C grade to 86 per cent in the D and E grades. The failure rate for appliance methods also increases as " tested " intelligence decreases but the total numbers are small.

The wife's " tested " intelligence therefore appears to be an important factor in relation to success or failure in use of birth control methods by the couple, whether we consider appliance and non-appliance methods together or separately. The lower social classes use birth control less extensively than the upper and have a greater proportion using non-appliance methods. Further, it is in these classes that we find people whose " tested " intelligence is low and thus associated with higher " failure rates " in birth control, by appliance or non-appliance methods, when they do use it. We know in the past that the largest families have been in the lower social classes. These conclusions appear to show that we will continue to get larger families from such groups. It is of interest, however, that women with lower test scores and women in lower social classes tend to state a preference during interview for family sizes of one or two children, while those with higher test scores, and those in the higher social classes, prefer three to four children. (See Appendix, tables marked with an asterisk.)

(c) *Plans for use of birth control after the first baby.*

We find that there is a stronger relationship between stated intention to use birth control after the first baby and social class than with intelligence test score, but neither is significant. Sufficient time has not elapsed to allow of adequate follow-up here as yet.

2. Use of Sources of Information about Pregnancy and Labour

Patients were asked three questions to find out the extent of their knowledge of the facts of pregnancy and labour, and how that knowledge had been obtained. They were asked if they had ever discussed such matters at home, with mothers, sisters, relatives or friends—this is classed as " *Home* " source, and is generally information of rather poor quality. They were asked if they had ever read any books, magazines or pamphlets, ever seen any films, or listened to any talks on the radio about childbearing—this is classed as " *Outside* " source, and is usually information of better quality than that obtained through " Home " sources. They were asked whether they intended coming to the talks at the clinic about labour—classed as " *Clinic* " source, information of good quality, and usually equivalent to the best obtained from " Outside " sources. For the purpose of analysis we have grouped the patients according to the presumed quality of the information :

Group One : " *Poor* "—that is, no source of information at all, or " Home " source only.

Group Two : " *Average* "—that is, either " Outside " *or* " Clinic " source, with or without " Home " source.

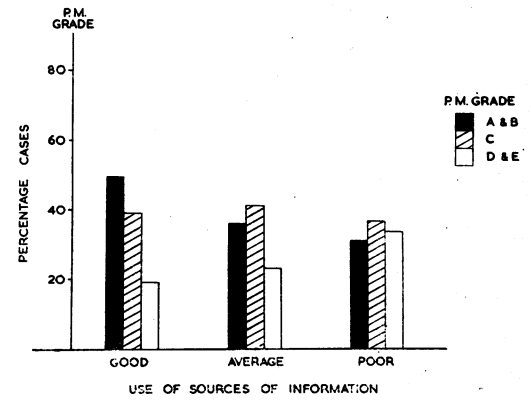
Group Three : " *Good* "—that is, both " Outside " *and* " Clinic "sources, with or without " Home " source.

This information was obtained from 388 patients. (383 who attended both sessions, and five who attended only one session. The five who did not complete the Progressive

Figure IV

PROGRESSIVE MATRICES (1938) GRADE AND USE OF SOURCES OF INFORMATION

383 BOOKED MARRIED CITY PRIMIGRAVIDAE – ABERDEEN 1950–52



Matrices test are omitted, therefore the results are based on 383 cases). (Figure IV.)

There is a significant association between presumed quality of sources of information and intelligence test grade. Those with higher test grades tend to use the " better " sources of information. This relationship can be observed within each social class and reaches significance in Classes IV and V. There is also a significant relationship with social class but it does not approach significance within each Matrices grade.

The relationship between intelligence test grade and the quality of sources of information does not hold so strongly for women over twenty-five years of age. These older women tend to use better sources of information more extensively irrespective of test score. It seems possible that this might be a social class effect as it will be remembered that Social Classes I and II tend to have a greater proportion of older women, but small numbers do not allow us to test this. However, older women have perhaps had more opportunity to gain knowledge of pregnancy and childbirth. In addition, older women, irrespective of social class, give the impression of being more careful in their planning and preparation. This may mean that they will use outside and clinic sources of information in order to clarify the knowledge they have got through social experience. Younger women because of their youth will have less opportunity to gain knowledge of pregnancy and childbirth through social experience, and here the use of better sources of information is more closely related to higher intelligence test score.

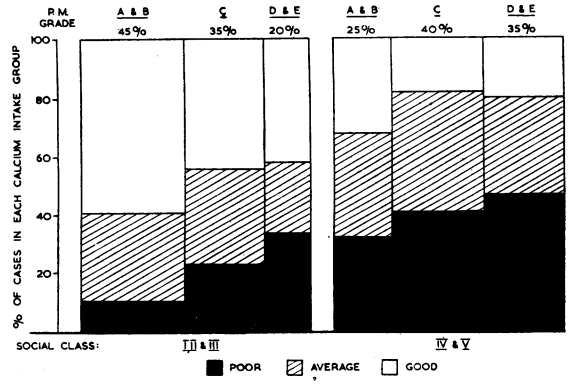
It can be argued, however, that both " intelligent " young women, and the older women are more likely to give an answer which they can appreciate is the " right " one. This, is, of course, possible and one of the disadvantages of the interview method of obtaining information. It is reasonable to assume that the woman who is more aware of propaganda and social pressures towards any course of behaviour will tend to say that she is going to behave in the recommended manner. It is equally reasonable that she is in fact more likely to behave in that way than is the woman who is unaware of or resistant to these social pressures. (Knower, 1936; Cantril, 1947.) This will be later shown to be the case in relation to breast-feeding.

3. Diet During Pregnancy

Of those who took part in the psychological investigation 174 also took part in a dietary survey. The method employed was that the patient weighed her total food intake for one week in the seventh month of pregnancy. For the purposes of this study the calcium intake has been used to classify the quality of the diets. Calcium intake is determined mainly by consumption of milk and some milk products. Where these are high, diets as a whole tend to be better. (Thomson, 1953.) A daily intake of 1,500 milligrams or more is usually recommended during pregnancy and for the purposes of this paper we have classified a diet as good if it contains over 1,000 mg. daily, average if between 1,000 and 750, and poor if below 750 mg. This classification allows sufficient numbers in each group for statistical analysis. Social Classes I, II and III have had to be grouped together since there were only sixty cases between these three classes, the remaining 114 being from Classes IV and V. The preponderance of cases in Social Classes IV and V is due to the fact that the policy has been to study dietary intake in as many cases as possible in Social Classes IV and V,

Figure V

PROGRESSIVE MATRICES GRADE : SOCIAL CLASS AND CALCIUM INTAKE
174 BOOKED MARRIED CITY PRIMIGRAVIDAE · ABERDEEN 1950–1952



in which nutritional problems are likely to be at their most severe.

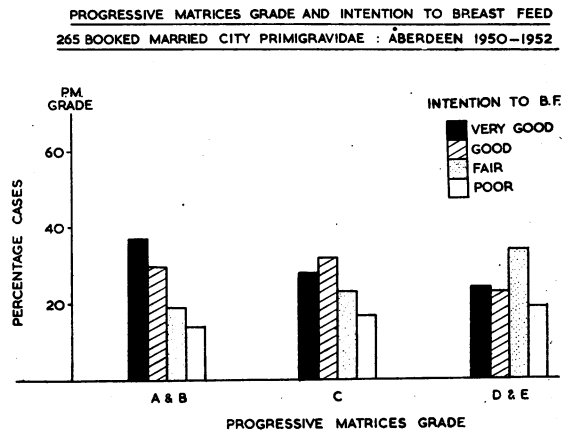
We find a highly significant association between quality of diet assessed by calcium intake and social class. There are fewer poor quality diets in Social Classes I, II and III, than in IV and V. The diagram suggests that intelligence test grade may be associated with the quality of the diet within social classes. Within each social group, the quality of diet improved as the intelligence grade improves. (Figure V.)

4. Breast-feeding

Patients were asked during interview whether they intended to breast-feed or bottle-feed their babies. Their responses were carefully noted verbatim and subsequently graded by three investigators independently on a five-point scale. A " Very Good " grading was given when the woman indicated that she was eager to breast-feed, and her statement had contained no reservations. For example, the reply " I'd like to breast-feed—if I can of course," was regarded as a qualification and was graded " Good." At the other end of the scale, a " Very Poor " grading was given when the woman said she did not intend to breast-feed, and a " Poor " grading when she said she did not intend to but added some qualification such as, " I expect I shall have to breast-feed in hospital." " Poor " and " Very Poor " grades are combined as " Poor " because of small numbers. Statements about breast-feeding were obtained from 384 cases (383 who attended both sessions and one who attended one session only). The following table is based on the 265 of the cases for which follow-up information is so far available.

Figure VI shows that women with higher Matrices grades appear to be more eager to breast-feed than women in the lower intelligence grades. This same association holds within Social Classes III and IV and V. Classes I and II cannot be tested because of small numbers. A similar trend can be shown independently between social class and intention to breast-feed (Ross, 1951), so that both intelligence and social class seem to play a part in determining attitude to breast-feeding. It may be contended that this is because women with higher intelligence test gradings or in upper social classes are more aware of the social pressures towards breast-feeding, thus are more likely to *say* they will breast-feed. Our hypothesis is that women who have stronger intentions, even if this be due to awareness

Figure VI

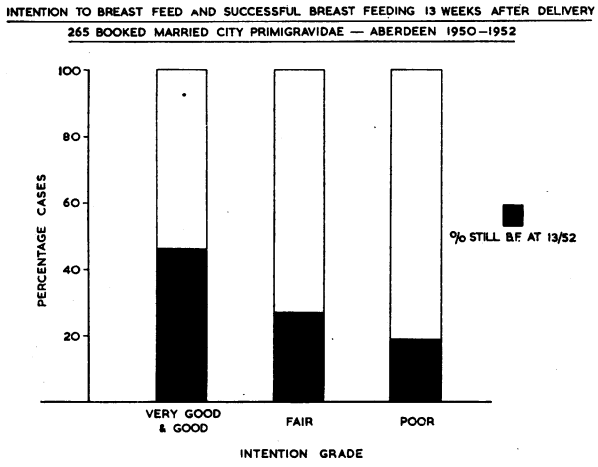


of social pressures, will in fact be more likely to breast-feed. The social investigators have been following up cases for three months after delivery to see which patients still continue to breast-feed. This data is so far available on the 265 cases. While it is appreciated that there can be sound medical reasons for the cessation of breast-feeding, it is proposed to consider all cases together irrespective of reason for stopping. In Figure VII, patients have been divided into those still breast-feeding or giving complementary feeds, and those who have completely stopped breast-feeding. The data was collected at the thirteenth week after delivery.

Figure VII shows the highly significant relationship between intention to breast-feed and actual performance. Those whose intention of breast-feeding was graded as " Very good " or " Good " have 46 per cent breast-feeding at thirteen weeks as against 27 per cent in the " Fair " group and only 19 per cent of those whose intention was " Poor."

The ante-natal statement of intentions regarding feeding the baby appears to correspond fairly well with what actually takes place. This relationship is similar to one reported by Newton and Newton (1950), in which 74 per cent with good attitudes, 35 per cent with doubtful and 26 per cent

Figure VII



with negative attitudes towards breast-feeding, did in fact breast-feed successfully until they left hospital. The longer follow-up period here probably accounts for the difference in overall percentages.

Conclusions

We have examined four aspects of maternal behaviour before and during first pregnancy and related these to Progressive Matrices grades.

These four aspects of maternal behaviour might be given more meaning for us if we considered them all together in terms of " preparatory attitudes " or better, " preparatory set to maternity." (Bevan and Dukes, 1953.) Using this collective term, we find that intelligence test scores help to differentiate between those having a good set, and those having a poor set. The woman who is more careful in planning her first pregnancy, who makes more effort to find out the facts of pregnancy and labour, who has a better quality diet and who is more eager to breast-feed her baby tends to have a higher intelligence test score. She also tends to belong to the upper social groups as determined by her husband's social class. The high association between Progressive Matrices score and social class has made our interpretation rather complicated. Further, where there was an association between age and behaviour, we have been unable to determine whether this is a true age difference irrespective of social class effect, because the small proportions of older women in Classes IV and V and of younger women in Classes I and II would not bear the heavy cross classification necessary.

To sum up, our data indicates that in the sample studied :

(1) Use of birth control and the kind of method used is positively associated with social class, while effective use of birth control is positively associated with intelligence test grade.

(2) The use of sources of information, as graded in this paper, is positively associated with both intelligence test grade and social class, but more detailed analysis of the data showed a stronger relationship with intelligence test grade.

(3) Quality of diet, measured by calcium intake, is positively associated with social class, but the figure illustrating this point suggests that intelligence test grade also might be positively associated with quality of diet.

(4) Intention to breast-feed discussed with each patient antenatally is positively related to both intelligence test grade and social class, but in neither case are these relationships significant.

It is hoped to show in a later paper that " maternal preparatory set " and " tested " intelligence are related to other aspects of childbearing such as duration and type of labour. As attitudes cannot be fully comprehended in isolation the behaviour and attitudes discussed here can only be fully understood within a wider context.

It will be obvious, however, that having a first child is only one incident in the total childbearing life of these women. Most of them will have subsequent pregnancies. It would be of great interest to relate intelli-

gence test scores and preparatory set at first pregnancy to some aspects of the woman's complete childbearing life. We would like to consider, for example, size and spacing of the completed family, together with the incidence of maternal or infant illness or mortality in seven to ten years' time. It would be of practical value to the obstetrician if we could show that intelligence and maternal behaviour in first pregnancy could indicate future behaviour in planning and caring for the completed family.

Acknowledgments

The psychological survey, as indicated, forms part of a wider inquiry into the facts of reproductive efficiency, and I am very grateful to my colleagues who have generously given me data from their own parts of the investigation, and for much practical assistance, helpful criticism and advice in the preparation of this paper.

APPENDIX

The following tables show the expected and observed frequencies for each relationship illustrated in Miss Scott's paper.

In the following analyses X^2 has been calculated in the usual manner and the probability is that of the divergence from the null hypothesis. The probability levels are based on differences without regard to trends, as X^2 takes no account of the signs of the differences.

PROGRESSIVE MATRICES (1938) GRADE & HUSBAND'S SOCIAL CLASS.

396 BOOKED MARRIED CITY PRIMIGRAVIDAE, ABERDEEN 1950 - 52.

Grade / Class	A + B	C	D + E	All Grades Total
I & II	36 (17.39)	8 (16.36)	1 (11.25)	45
III	79 (75.34)	71 (70.91)	45 (48.75)	195
IV & V	38 (60.27)	65 (56.73)	53 (39.00)	156
All Classes Total	153	144	99	396

(Expected frequencies in brackets). $X^2_{(4)} = 48.453$

$P < .001$.

Corresponding to Figure I.

USE OF BIRTH CONTROL METHODS.

379 BOOKED MARRIED CITY PRIMIGRAVIDAE, ABERDEEN 1950-2.

(1) PROGRESSIVE MATRICES GRADE.

Grade / Use of Birth Control	A + B	C	D + E	All Grades
Yes	92 (81.28)	65 (74.28)	47 (48.44)	204
No	59 (69.72)	73 (63.72)	43 (41.56)	175
All Cases	151	138	90	379

$X^2_{(2)} = 5.67$ $P < .06$

(2) HUSBAND'S SOCIAL CLASS.

Class / Use of Birth Control	I & II	III	IV & V	All Classes
Yes	34 (24.22)	104 (100.65)	66 (79.13)	204
No	11 (20.78)	83 (86.35)	81 (67.87)	175
All Cases	45	187	147	379

$X^2_{(2)} = 13.52$ $P < .002$

Corresponding to Figure II.

USE OF BIRTH CONTROL AT TIME OF CONCEPTION.

204 BOOKED MARRIED CITY PRIMIGRAVIDAE, ABERDEEN 1950-52.

(1) PROGRESSIVE MATRICES GRADE.

Grade / Use of Birth Control	A + B	C	D + E	All Grades
Yes	38 (43.74)	29 (30.91)	30 (22.35)	97
No	54 (48.26)	36 (34.09)	17 (24.65)	107
All Cases	92	65	47	204

$X^2_{(2)} = 6.65$ $P < .04$

(2) HUSBAND'S SOCIAL CLASS.

Class / Use of Birth Control	I & II	III	IV & V	All Classes
Yes	13 (16.17)	48 (49.45)	36 (31.38)	97
No	21 (17.83)	56 (54.55)	30 (34.62)	107
All Cases	34	104	66	204

$X^2_{(2)} = 2.56$ $P < .3$

Corresponding to Figure III.

PROGRESSIVE MATRICES (1938) GRADE AND USE OF SOURCES OF INFORMATION.

383 BOOKED MARRIED CITY PRIMIGRAVIDAE, ABERDEEN 1950-52.

Use of Sources \ Grade	A + B	C	D + E	All Grades
Good	69 (55.16)	43 (50.44)	27 (33.38)	139
Average	58 (63.90)	66 (58.44)	37 (38.68)	161
Poor	25 (32.94)	30 (30.12)	28 (19.94)	83
All Types	152	139	92	383

$X^2_{(4)} = 12.56$

$P < .02$

Corresponding to Figure IV.

SOCIAL CLASS AND CALCIUM INTAKE.

174 BOOKED MARRIED CITY PRIMIGRAVIDAE, ABERDEEN 1950-52.

Social Classes \ Calcium Intake	Good	Average	Poor	
I & II & III	30 (18.97)	18 (23.10)	12 (17.93)	60
IV & V	25 (36.03)	42 (43.90)	47 (34.07)	114
	55	67	52	174

$X^2_{(2)} = 17.87$ $P < .001$

Corresponding to Figure V.

PROGRESSIVE MATRICES GRADE (1938) & INTENTION TO BREAST FEED.

265 BOOKED MARRIED CITY PRIMIGRAVIDAE, ABERDEEN 1950-52.

Intention \ Grade	A	B	C	D+E	All Grades
Very Good	18 (10.39)	19 (20.17)	29 (31.48)	15 (18.96)	81
Good	8 (9.88)	22 (19.17)	33 (29.93)	14 (18.02)	77
Fair	5 (8.21)	14 (15.94)	24 (24.88)	21 (14.97)	64
Poor and Very Poor	3 (5.52)	11 (10.72)	17 (16.71)	12 (10.05)	43
All Cases	34	66	103	62	265

$X^2_{(9)} = 14.13$ $P < .1$

Corresponding to Figure VI.

INTENTION TO BREAST FEED & SUCCESSFUL BREAST FEEDING (AT 13 WEEKS AFTER DELIVERY).

265 BOOKED MARRIED CITY PRIMIGRAVIDAE, ABERDEEN 1950-52.

Record \ Intention	V.Good & Good.	Fair	Poor & V.Poor	
Still B.F.	73 (58.43)	17 (23.67)	8 (15.90)	98
Ceased B.F.	85 (99.57)	47 (40.33)	35 (27.10)	167
All Cases	158	64	43	265

$X^2_{(2)} = 14.98$ $P < .001$

Corresponding to Figure VII.

* PROGRESSIVE MATRICES (1938) AND SIZE OF FAMILY WANTED.

378 BOOKED MARRIED CITY PRIMIGRAVIDAE, ABERDEEN 1950-52.

Size \ Grade	A + B	C	D + E	
Small	64 (76.59)	75 (69.44)	54 (46.97)	193
Average	67 (54.36)	41 (49.29)	29 (33.35)	137
Large	19 (19.05)	20 (17.27)	9 (11.68)	48
	150	136	92	378

$X^2_{(4)} = 9.51$ $P < .05$.

* HUSBAND'S SOCIAL CLASS AND SIZE OF FAMILY WANTED.

Size \ Class	I & II	III	IV & V	
Small	15 (22.47)	89 (94.97)	89 (75.56)	193
Average	23 (15.94)	70 (67.42)	44 (53.64)	137
Large	6 (5.58)	27 (23.62)	15 (18.80)	48
	44	186	148	378

$X^2_{(4)} = 11.49$ $P < .03$

Number of Children Wanted.

SMALL 1, 1-2, or 2
AVERAGE 2-3, 3, or 3-4.
LARGE 4 and over.

* See page 145.

HEALTH AND PHYSIQUE OF MOTHERS IN VARIOUS SOCIAL GROUPS

By Professor D. Baird

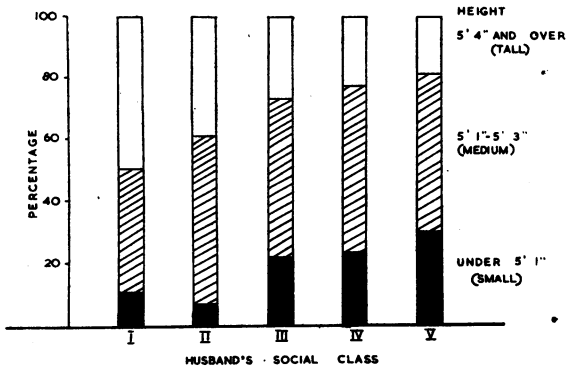
Miss Scott has shown that on the whole women in Social Classes I and II are more intelligent, more knowledgeable, take a better diet and show more initiative than those in Classes III, IV and V. I should now like to describe the differences in health and physique of the mothers in the various social groups and show how these factors influence the outcome of pregnancy and labour.

Figure I shows that there is a definite social gradient for height, the proportion of small women (less than 5 ft. 1 in.) rising steadily as the social status falls.

Figure I

HEIGHT DISTRIBUTION IN EACH SOCIAL CLASS

ABERDEEN MARRIED PRIMIPARAE 1949–51



In hospital patients, corresponding roughly to Social Classes III, IV and V, tall women appeared healthier than small women. The state of health was assessed subjectively at the antenatal clinic into one of five grades varying from excellent to very poor, and Table 1 shows that amongst those assessed as being in excellent health 41 per cent were tall and 11 per cent small, whereas of those graded as poor or very poor, 14 per cent were tall and 44 per cent small.

The incidence of prematurity and stillbirth was twice as great in small as in tall women and in women of the same height was twice as frequent in those in poor or very poor health compared to those in excellent or very good health. This method of assessing standards of health, although admittedly rather subjective, does pick out those with an increased liability to stillbirth and prematurity.

Table 1

PHYSICAL GRADING BY HEIGHT IN 1791 BOOKED MARRIED PRIMIPARAE

ABERDEEN MATERNITY HOSPITAL 1949–1950

	EXCELLENT	GOOD	FAIR	POOR & VERY POOR	NOT GRADED
TALL	41	30	18	14	28
MEDIUM	48	50	53	42	50
SMALL	11	20	29	44	22
ALL HEIGHTS	100	100	100	100	100

The association between short stature, poor health and poor reproduction suggests that such women are stunted and that their short stature is not inherited. How therefore has it come about? Table 2 shows the relationship between intelligence and height, and intelligence and number of mother's brothers and sisters in each social class in 295 of Miss Scott's cases in whom the father's occupation was known.

It shows that with regard to height and intelligence there is a steady increase in correlation from Classes I and II to IV and V.

Table 2

CORRELATIONS BETWEEN: INTELLIGENCE
HEIGHT
SIZE OF BIOLOGICAL FAMILY

FATHER'S SOCIAL CLASS	NUMBER OF CASES	INTELLIGENCE AND HEIGHT	INTELLIGENCE AND FAMILY SIZE
I & II	45	082 (N.S.)	—·186 (N.S.)
III	121	·141 (N.S.)	—·246 (1%)
IV & V	129	·248 (1%)	—·217 (5%)

NOTE: (1) BASED ON 1/6 SAMPLE OF BOOKED, MARRIED, CITY PRIMIPARAE (1950–1952)

(2) INTELLIGENCE IS REPRESENTED BY SCORE ON RAVEN'S PROGRESSIVE MATRICES (1938) 20 MINUTE VERSION

There is a negative correlation between intelligence and the size of family which is more marked in Social Classes III, IV and V than in Classes I and II. These figures lend some support to my own clinical impressions which are somewhat as follows:

In Social Classes I and II, children probably get enough food, fresh air and exercise to grow to their full height whatever the differences in income or intelligence of the parents with the result that very few are small (under 5 ft. 1 in.) and differences in adult height are more likely to be due to genetic differences.

In the lower income groups where money is scarce, the more intelligent parents will be more likely to use their limited resources to the best advantage in an effort to give their children the best chance within their power. They will thus limit the number of children to ensure that they get good food and healthy surroundings. The daughters will, therefore, tend to grow to their full height and to be healthy. Since the parents are above average intelligence for their class the daughters are likely, on the average, to be more intelligent. In addition their superior health and home background will probably increase their chance of doing well in the intelligence test. Where the parents are less intelligent there is less likelihood that the size of the family will be so carefully controlled so that there will be less money to go round and as a result diet and living conditions will be less good. The daughters will, therefore, not grow to their full potential height and will tend to be small. The daughters, like the parents, will have a greater chance of being of less than average intelligence. This might explain why in Social Classes III to V, but not in Classes I and II, small women tend to come from large families and to be less intelligent than tall women.

It has been said that a poor diet does not cause permanent stunting, but only slows down the rate of growth and the full predetermined height is eventually reached. If this were so it would be difficult to explain why the average height throughout the country is not falling since Social Classes IV and V, who are small, have more children than those in Classes I and II, who are taller. Table 3 shows that small women, aged 15-24, who had a first baby in the Aberdeen Maternity Hospital in 1948, are showing a distinct tendency to have larger families than tall women of the same age group. In the four years since 1948 the small women produced 25 per cent more babies than the tall women.

Table 3

PRIMIGRAVIDAE AGED 15–24 IN 1948

NUMBER OF SUBSEQUENT CHILDREN TILL THE END OF 1952

	TOTAL CASES	PERCENTAGE WITH SUBSEQUENT PREGNANCIES	1 ONLY	2 ONLY	3 ONLY	4 ONLY
SMALL	141	57 (80)	37 (52)	16 (23)	3 (4)	1 (1)
MEDIUM	274	53 (146)	38 (104)	13 (36)	2 (6)	—
TALL	146	50 (73)	42 (61)	7 (10)	1 (1)	—

( ) NUMBER OF CASES

As already stated small women show relatively high prematurity and stillbirth rates. They also require Cæsarean section frequently because of disproportion between the baby's head and the mother's pelvis, whereas in women of 5 ft. 4 in. or more Cæsarean section for this cause is rarely necessary.

Table 4 shows the shape of the pelvis in 100 tall and 100 small women divided into two groups according to whether the health was judged to be good or poor.

Table 4

DISTRIBUTION OF PELVIC BRIM SHAPES

(NICHOLSON'S CLASSIFICATION) BY HEIGHT AND PHYSIQUE

		ROUND OR LONG OVAL	FLAT OR TRIANGULAR	ALL SHAPES
TALL	GRADE I	93·9	6·1	100
	GRADE II	88·0	12·0	100
SMALL	GRADE I	78·9	21·1	100
	GRADE II	60·5	39·5	100

Forty per cent of small women in poor health (grade II) and 6 per cent of tall women in good health (grade I) had a flat pelvis. In a healthy woman the brim of the pelvis

is practically round; flattening of the posterior segment of the brim is a sign of disease. The capacity of the brim is directly proportional to the height of the woman, consequently the small and unhealthy woman has not only a deformed but a small pelvis, hence the high incidence of difficult labour and the high Cæsarean section rate. It is difficult, therefore, to believe that such small women are fully grown.

Although it is known that childbearing is unusually dangerous in small unhealthy women they nevertheless are much more prone to have large families. In Aberdeen Social Class V contributes 12 per cent of first births and 30 per cent of fifth and subsequent births.

Table 5 shows that in the Aberdeen Maternity Hospital the proportion of small mothers increases with the increase in the number of children.

Table 5

HEIGHT DISTRIBUTION BY PARITY

ABERDEEN MATERNITY HOSPITAL BOOKED MARRIED CITY CASES

NO. OF PREGNANCY	1	2	3	4-6	7+
TALL	26	23	20	15	11
MEDIUM	48	48	49	48	47
SMALL	24	25	28	33	40
NOT STATED	2	4	3	4	2
ALL HEIGHTS	100	100	100	100	100

Forty per cent of those having a seventh or subsequent child are under 5 ft. 1 in., and in a series of cases where pregnancy was terminated or sterilization was performed, because of multiparity and debility 42 per cent were small. Such patients are unable to help themselves and are usually living in sordid conditions, the husband often being unemployed. Sterilization gives the woman instant and complete relief from the constant dread of pregnancy and leaves her free to concentrate on the care of the children she already has. In properly selected cases it contributes greatly to the happiness and stability of the family. Maternal mortality and stillbirth rates are high in this group but under the active policy pursued in Aberdeen such women contribute nothing to maternal mortality and very little to the stillbirth rate.

From the eugenic point of view little can be said against it since our investigations suggest that children of such parents are less likely than average to be of high intelligence and in any case the poor environment makes it unlikely that they will be able to make full use of their inherited abilities.

Miss Scott has shown that 34 per cent of childbearing women in Social Classes IV and V are of poor or very poor intelligence. The combination of low intelligence and poor environment makes the effective use of contraceptives almost impossible in these cases. They constitute a problem group in which surgical measures may be necessary to prevent further unwanted pregnancies which would almost certainly prove disastrous to the health and well-being of the mother and family. As Social Classes IV and V contribute 30 per cent of the total births and as we have seen one-third of the child-bearing women in these social classes are of low intelligence, it follows that this problem group of low intelligence in a poor environment comprises about 10 per cent of all childbearing women.

In Aberdeen in the last four years the average stillbirth rate was twenty—a low figure by past standards—yet there are still many small unhealthy women in the city whose reproductive efficiency is low. Many of these are intelligent enough to do very much better. Women of the same level of intelligence in the upper economic groups reproduced more efficiently. There is still, therefore, much scope for lowering the stillbirth rate by improving the social and economic conditions of the lower income groups.

REFERENCES

Baird, D. and Illsley, R. (1953), *Proc. Roy. Soc. Med.*, **46,** 2, p. 53

Bevan, W. and Dukes, W. F. (1953), *Brit. J. Psychol.*, **44,** p. 52.

Cantril, H. (1947), *Gauging Public Opinion*, Princeton Univ. Press.

Knower, F. H. (1936), *J. Ab. Soc. Psychol.* **30,** p. 522.

Lewis-Faning, E. (1949), *Papers of the Royal Commission on Population*, **1,** H.M.S.O.

Monahan, T. P. (1950), *Hum. Biol.*, 1950, **22,** p. 281.

Newton, N. R. and Newton, M. (1950), *Paediatrics*, **5**, p. 869.
Raven, J. C. (1938), *Guide to using Progressive Matrices*, H. K. Lewis.
Raven, J. C. (1939), *Brit. Journ. Med. Psychol.*, **19**, p. 137.
Richardson, H. M. (1939), *Psychol. Bull.*, **36**, p. 104.
Rosen, E. (1951), *J. App. Psychol.*, **35**, p. 185.
Ross, A. I. (1951), *Lancet*, **260**, p. 630.
Stewart, D. B. and Scott, E. M. *Edin. Med. J., Trans. Edin. Obs. Soc.*, **60**, 49.
Thomson, A. M. (1953), Personal communication.
Vernon, P. E. and Parry, J. B. (1949), *Personnel Selection in the British Forces*. Univ. of London Press.
Willoughby, R. R. (1927). *Genet. Psychol. Monog.*, **2**, 235.